In : Lee, Jeffrey A. and Zobeck, Ted M., 2002, Proceedings of ICAR5/GCTE-SEN Joint Conference, International Center for Arid and Semiarid Lands Studies, Texas Tech University, Lubbock, Texas, USA Publication 02-2 p. 410

Cenozoic soil sequences and paleoenvironments of West Texas, USA

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Abstract

Since the Tertiary, material eroding from the backwearing of the eastern edge of the High Plains escarpment has been aggrading in a basin identified by Frye and Leonard (1964) as Pleistocene Lake Lomax. The presence of buried soils in exposures indicates episodic rather than continual rates of deposition. Throughout much of the year, evapotranspiration is high and many ground soils have accumulated calcium carbonate horizons. Several ground soils also contain petrocalcic horizons. These near-surface petrocalcic horizons are likely relict and in places appear to be degrading under current climatic conditions. In order to better understand present and earlier climatic conditions, paleoenvironmental variability can be inferred both from the clastic depositional sequences and the profile characteristics of buried soils. North of Big Springs, Texas, a hole drilled from the ground surface to the top of the Triassic beds penetrated more than 30 m of successive buried soils. Source materials include colluvium from eroded Ogallala, Cretaceous, and Tertiary clastic sediments. Few buried A horizons are preserved in the paleosols. Many paleosols are clearly welded. Commonly, there are alternating sequences of argillic and calcic horizons indicating fluctuations in precipitation intensity or in its occurrence. Some soils are separated by intervening colluvial and lake-bed sediments. The lacustrine deposits have a low bulk density that may indicate some ash influence. At least one buried soil located immediately below a lacustrine deposits exhibited gleyed colors indicative of reducing conditions. Following subaerial exposure, the gleyed colors rapidly became indistinguishable from the whitish colors of carbonate in the calcic and petrocalcic horizons of paleosols above and below. A sharp sedimentary boundary, marked by a very abrupt loss of carbonates at 29 m, is representative of a significant environmental change. A red, Triassic paleosol containing numerous root casts and insect burrows lies beneath and indicates a much higher level of biotic activity in this weathered shale than found in soils elsewhere in the sequence.

Reference

Frye, J.C. and Leonard, A. B. 1964. Relation of Ogallala Formation to the Southern High Plains of Texas. Report of Investigations No. 51. Bureau of Economic Geology, University of Texas, Austin TX.